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NATIONAL DAM SAFETY PROGRAM. LAKE VIEW DAM (VA-04119), MIDDLE J--ETC(U)
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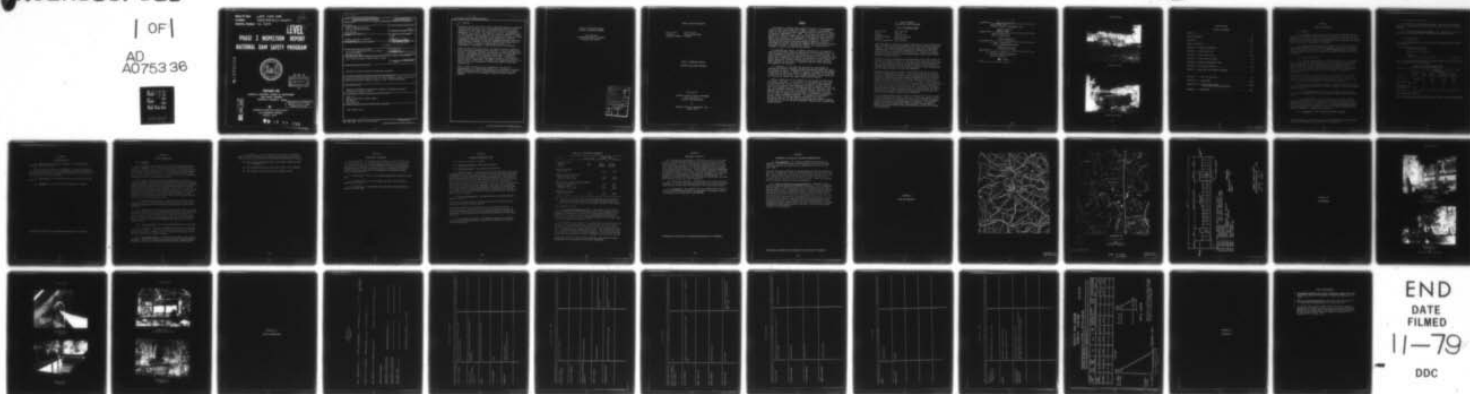
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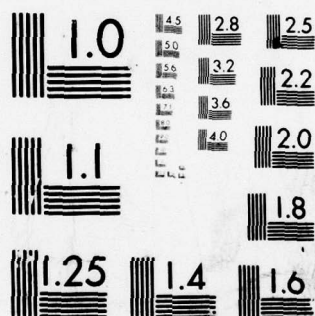
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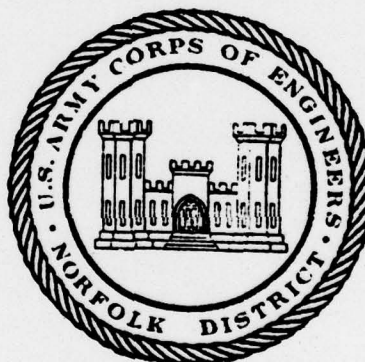
Name Of Dam: LAKE VIEW DAM
Location: CHESTERFIELD COUNTY
Inventory Number: VA. 04119

LEVEL

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

ADA075336



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PREPARED FOR
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

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BY
DEWARD M. MARTIN & ASSOCIATES
WILLIAMSBURG, VIRGINIA
AUGUST, 1979

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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary. ←

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

LAKE VIEW DAM
CHESTERFIELD COUNTY, VIRGINIA
INVENTORY NO. 04119

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Justification	
By	
Distribution/	
Availability Codes	
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MIDDLE JAMES RIVER BASIN

Name of Dam: Lake View Dam
Location: Chesterfield County
Inventory Number: VA 04119

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared for
NORFOLK DISTRICT CORPS OF ENGINEERS
803 Front Street
Norfolk, Virginia 23510

by
Deward M. Martin & Associates, Inc.
August 1979

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam: Lake View Dam
State: Virginia
County: Chesterfield
USGS Quad Sheet: Chester, Virginia
Stream: Swift Creek
Date of Inspection: June 25, 1979

Lake View Dam is a concrete structure about 418 feet long and 38.6 feet high. The dam is owned and operated by the City of Colonial Heights, Virginia. The dam is classified as small in size with a high hazard classification. The spillway consists of a concrete weir 216 feet wide with a crest elevation of 55.6 feet m.s.l. There is a concrete outlet structure located in the reservoir which can be used to drain the lake to elevation 36.0.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood is 1/2 of the PMF. The spillway will pass 6% of the PMF without overtopping the dam. The Spillway Design Flood will overtop the dam by 9.9 feet with an average critical velocity of 14.3 feet per second. Since the spillway will not pass the SDF it is rated as inadequate.

Immediate action should be taken to assess the stability of the dam. It is recommended that the owner, at his own expense, secure the services of a professional engineer, who in conjunction with a qualified geologist, should map the rock formations underlying the dam. Visual mapping should be supplemented by a field subsurface investigation which should include but not be limited to: location of and determination of the extent of weathered rock, determination of the weathering rate and its effect on the stability of the dam, and determination of any hydrostatic uplift pressures on the dam. In addition, the investigation should provide recommendations for remedial action to correct the problems of seepage through the cracks and the holes in the dam as well as the seepage through the dam foundation.

It is recommended that within 3 months of notification by the Governor of the Commonwealth of Virginia, the owner, at his own expense, have a schedule for the investigations and the remedial actions recommended which is acceptable to the Commonwealth of Virginia. The remedial actions are not to be limited to those contained in this Phase I Report, but should include others determined as a result of the Phase II investigation

Prepared By:

Paul Seiler
PAUL SEILER, P.E.

Deward M. Martin & Associates, Inc.

Original signed by:

Submitted By:

JAMES A. WALSH

JAMES A. WALSH, P.E.

Chief, Design Branch

Original signed by:

Recommended By:

Carl S. Anderson, Jr.

for JACK G. STARR, P.E.

Chief, Engineering Division

Original signed by:

LTC Leonard C. Gregor

Approved By:

for DOUGLAS L. HALLER

Colonel, Corps of Engineers

District Engineer

SEP 27 1979

Date

LAKE VIEW DAM



Overview of Dam



Front View of Dam

LAKE VIEW DAM

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SECTION 1

PROJECT INFORMATION

1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972 authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program of safety inspections of dams through the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Appendix V, Reference 3). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: The Lake View Dam is a concrete dam 418 feet long and 38.6 feet high with a crest elevation of 60.6 feet.* The upstream slope of the dam is 1(H):1(V). The downstream side of the dam has a system of walls, normal to the crest, on 18-foot centers. These walls have concrete struts between them and openings through which a walkway passes, just behind the crest of the dam (see Appendix II, Photograph No. 3).

The spillway consists of a "sharp crested" concrete weir 216 feet long with a crest elevation of 55.6 feet m.s.l. and a width of 1 foot. A concrete intake structure, operated manually by two 5-foot x 10-foot slide gates, can be used to lower the pool level to elevation 32.0.

1.2.2 Location: The Lake View Dam is located on Swift Creek, one-half mile west of the intersection of Route 1 and Picket Avenue in Colonial Heights, Virginia.

1.2.3 Size Classification: The dam is classified as small in size because of height (38.6 feet) and maximum storage capacity (940 acre feet.)

1.2.4 Hazard Classification: This dam is located in an urban area where extensive losses could occur, therefore it is given a high hazard classification in accordance with the guidelines contained in Section 2.1.2 of Reference 1, Appendix IV. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: City of Colonial Heights, Virginia.

*Height is based on the difference in elevation between the crest of the dam and the streambed at the downstream toe of the dam.

1.2.6 Purpose: Recreation

1.2.7 Design and Construction History: There was no information available pertaining to the design or construction history of the Lake View Dam.

1.2.8 Normal Operational Procedures: The regulation of the reservoir level is automatic as water rises above the spillway crest.

1.3 Pertinent Data:

1.3.1 Drainage Area: The dam controls a drainage area of 167.88 square miles.

1.3.2 Discharge at Dam Site:

Maximum Flood - Unknown.

Spillway

pool level at the top of dam 7,970 c.f.s.

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

Table 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet m.s.l.	Reservoir			
		Area, Acres	Capacity		
			Acre, feet	Watershed, inches	Length, miles
Top of Dam	60.6 (b)	93	940	0.10	2.67
Spillway Crest(a)	55.6	38	610	0.07	2.37
Streambed at the toe of dam	22+	--	--	--	--

(a) Normal pool elevation

(b) From Chesterfield County Bridge Survey, 1979, U S Corps of Engineers.

SECTION 2

ENGINEERING DATA

2.1 Design: No design data, drawings or calculations were available for Lake View Dam.

*2.1.1 Geologic Setting of the Dam Site: The dam is located in the Piedmont Geologic Region. The underlying bedrock is believed to be the Petersburg Granite. Numerous rock outcrops are exposed at the ground surface in the dam vicinity.

2.2 Construction: No construction data was available for this dam.

2.3 Evaluation: There are no data available to evaluate.

*Information provided by Law Engineering Associates of Virginia.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

3.1.1 General: The results of the 25 June 1979 inspection are included in Appendix III. At that time the pool elevation was 56.0 feet m.s.l. which is normal. There are no known previous inspections of this dam. The ground around the left abutment was mainly composed of rock and was covered with trees. The area around the right abutment was flat and covered with grass. There were no signs of dampness, sloughing or erosion around either abutment.

3.1.2 Dam: There were no obvious misalignments in the dam although numerous cracks and holes were detected. Flow varies through these cracks from a minor seep to an excess of 5 gpm in the slide gates. A number of cracks were noted in the construction joints and seepage was observed in these areas (see Appendix I, Plate No. 1). The dam appears to bear on granite bedrock, however, some of the bedrock at the bottom of the three panels to the right of the spillway is severely weathered and several pieces were easily broken by hand. Seepage (approximately 1 gpm) was observed at the toe near the right abutment adjacent to an area of weathered rock.

3.1.3 Appurtenant Structures: Observation of the intake structure and slide gate from the upstream side did not reveal any deterioration, however, most of the structure was submerged at the time of inspection.

3.1.4 Spillway: At the time of inspection, water appeared to be flowing over the spillway crest at different elevations (see Photograph of the front view of the dam, page iii.) This may have been due to minor variations in the elevation of the crest of the spillway, however, the fact that water was flowing over the crest of the spillway made it difficult to accurately determine the cause for the irregularity of flow.

3.1.5 Instrumentation: There is no instrumentation in this dam.

3.1.6 Reservoir: The area surrounding the dam is forested and flst with no evidence of shoreline erosion or slope failure. An old railroad embankment extends out into the reservoir from either side of the banks about 600 feet above the dam.

3.1.7 Downstream Channel: The downstream channel is the natural streambed. The dam is located at the city limits of Colonial Heights, Virginia, adjacent to the Sherwood Hills and Woodlawn Subdivisions.

3.2 Evaluation: It is recommended that the owner, within the next 12 months investigate the following deficiencies to determine their significance and affect on the stability and safety of the dam:

- (1) The numerous leaks and cracks in the dam as shown on Plate No. 1, Appendix I.
- (2) The weathered bedrock in the panels right of the spillway.
- (3) The possible deterioration of the spillway crest.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure: The normal pool elevation is 55.6 feet which is the spillway crest. The reservoir was originally used to supply water for a filtration plant in Colonial Heights, however, it is currently used only for recreation. The reservoir level is normally maintained by the height of the spillway crest, however, there are two 5-foot x 10-foot slide gates which have the capability of lowering the water level to elevation 32.0.

4.2 Maintenance: There is no current maintenance program for this dam.

4.3 Warning System: At the present time there is no warning system for this dam.

4.4 Evaluation: A maintenance and inspection program should be initiated by the owner.

SECTION 5

HYDRAULIC/HYDROLOGIC DATA

5.1 Design: None were available.

5.2 Hydrologic Records: None were available.

5.3 Flood Experience: No records were available.

5.4 Flood Potential: The PMF and 1/2 PMF were developed and routed through the Swift Creek Reservoir and the Lake View Dam reservoir by use of the HEC-1 computer program (Reference 2, Appendix IV) and appropriate unit hydrograph precipitation, and storage-outflow data. The flood inflow to the Lake View Dam reservoir was developed by translating the outflow at the Swift Creek Dam to the Lake View Dam Reservoir with the added flow from below the Swift Creek Dam. Clark's Tc and R coefficients for the local drainage area were estimated from basin characteristics. The rainfall applied to the developed unit hydrograph was obtained from a U S Weather Bureau Publication (Reference 3, Appendix IV.) Losses were estimated at an initial loss of 1.0 inch and a constant loss thereafter of 0.05 inch/hour.

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1.

Water flows past the dam over the spillway in the event water in the reservoir rises above elevation 55.6.

The storage curve was calculated by use of U S Geological Survey Quadrangle Maps. Rating curves were developed for the spillway and non-overflow section of the dam. In routing hydrographs through the reservoir, it was assumed that the initial pool level was at the spillway crest.

5.6 Overtopping Potential: The probable rise of the reservoir and other pertinent information on reservoir performance is shown in the following table:

Table 5.1 RESERVOIR PERFORMANCE

Item	Normal Flow	Hydrograph	
		1/2 PMF	PMF (a)
Peak Flow, c.f.s.			
Inflow	168	58,520	133,140
Outflow	--	58,350	132,320
Maximum elevation feet, m.s.l.		70.5	79.7
Spillway (elevation 55.6)			
Depth of flow, feet		14.9	24.1
Velocity, f.p.s. (b)		18.3	23.2
Non-overflow section (elevation 60.6)			
Depth of flow, feet		9.9	19.1
Duration, hours		40	50
Velocity, f.p.s. (b)		14.3	19.8
Tailwater elevation, feet , m.s.l.	24 ₊	45 ₊	54 ₊

(a) The PMF is an estimate of flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonable possible in the region.

(b) Critical Velocity.

5.7 Reservoir Emptying Potential: Two 5-foot x 10-foot slide gates near the toe of the dam at elevation 32.0 are available for dewatering the reservoir. The slide gates will permit withdrawal of about 446 c.f.s. with one foot vertical opening and the reservoir level at the spillway crest and essentially dewater the reservoir down to about elevation 36.0 in about 3 days.

5.8 Evaluation: Based on the size (small) and hazard (high) classifications the recommended Spillway Design Flood is 1/2 PMF to PMF. Based on the risk involved in this project it is considered that 1/2 PMF is appropriate as a Spillway Design Flood. The spillway will pass 6 % of the PMF without overtopping the dam . The 1/2 PMF will overtop the dam for 40 hours and reach a maximum of 9.9 feet over the top of the dam, with an average critical velocity of 14.3 feet per second.

Conclusions pertain to present day conditions. The effect of future development on the hydrology has not been considered.

SECTION 6

STRUCTURAL STABILITY

*6.1 Foundation and Abutments: The dam is believed to be underlain by Petersburg Granite much of which appears to be in a highly weathered state. Extensive weathering of the dam foundation in the three panels to the right of the spillway indicate that there could be a loss of bearing capacity of the dam foundation and an increase in hydrostatic uplift pressures. These changes, caused by weathering of the dam foundation, are likely to reduce the stability of the dam. In addition, seepage observed near the right abutment at the dam toe appears to be contributing to weathering of dam foundation. No drawings or construction data were available on the dam and no drains were apparent during the visual inspection.

6.2 Structural Stability: Although there was no apparent misalignment of the dam, the numerous indications of seepage, cracks and small holes indicate that the stability of the dam is questionable.

6.3 Evaluation: The evidence does not confirm that the dam is stable and further investigation is necessary to accurately analyze the stability of the dam and its foundation.

*Information provided by Law Engineering Associates of Virginia.

SECTION 7

ASSESSMENT AND REMEDIAL MEASURES/RECOMMENDATIONS

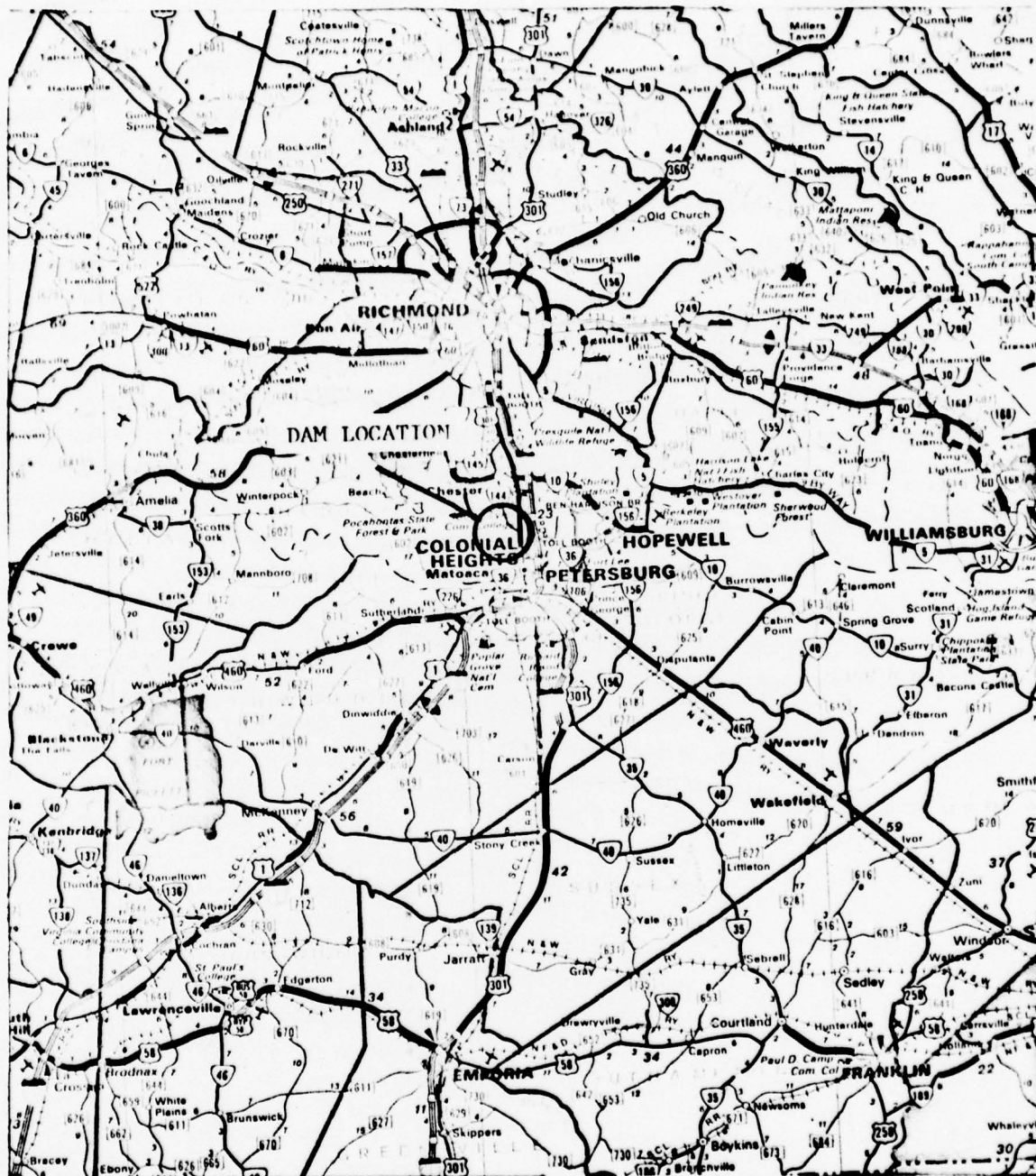
7.1 Dam Assessment: The overall condition of the dam is in question. Sufficient evidence, indicating deterioration of the dam and its foundation, was discovered to demonstrate the need for further study.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers, (OCE), the Spillway Design Flood is 1/2 of the PMF. The spillway will pass 6% of the PMF without overtopping the dam. The Spillway Design Flood will overtop the dam by 9.9 feet with an average critical velocity of 14.3 feet per second. Since the spillway will not pass the SDF it is rated as inadequate.

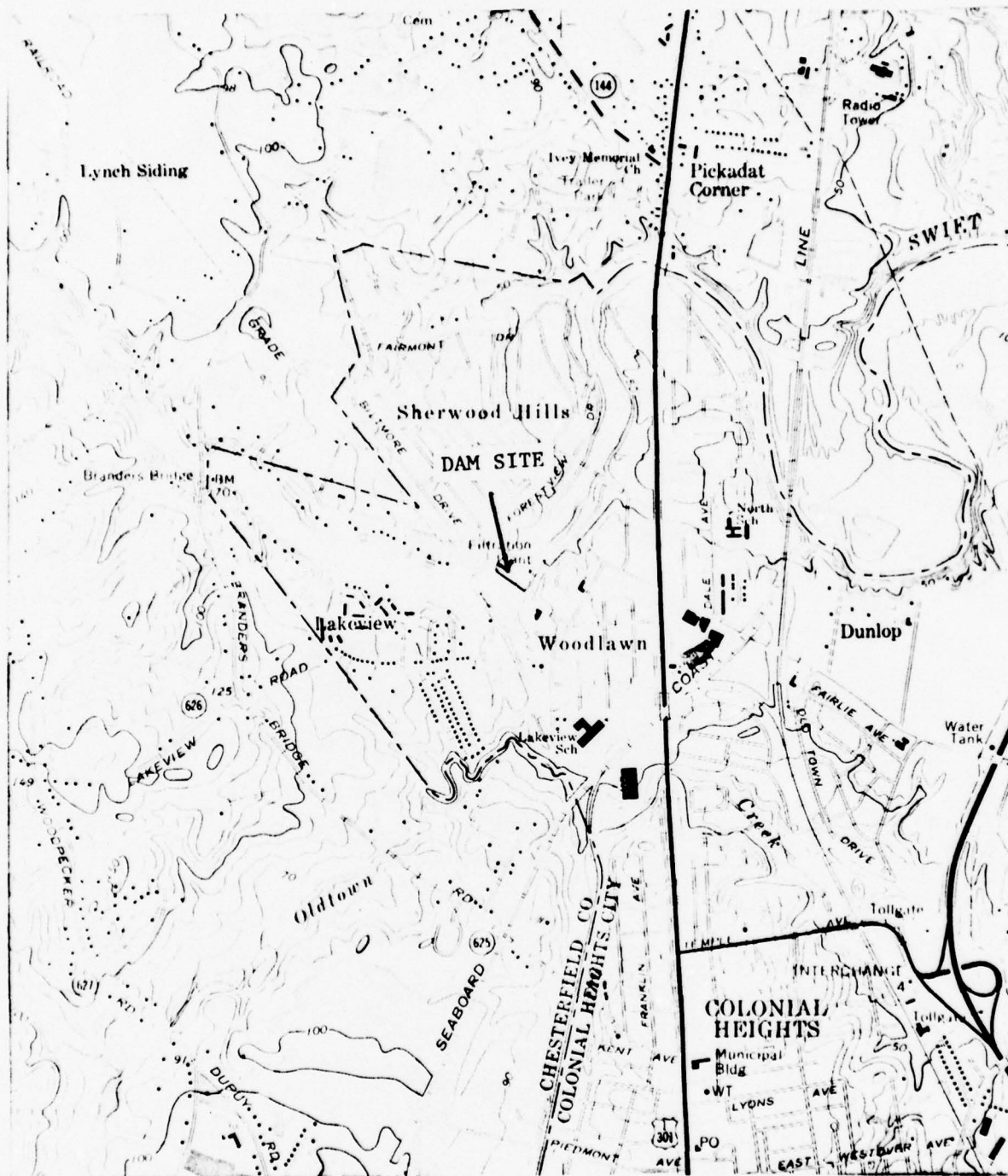
***7.2 Remedial Measures and Recommendations:** Immediate action should be taken to assess the stability of the dam. It is recommended that the owner, at his own expense, secure the services of a professional engineer who, in conjunction with a qualified geologist, should map the rock formations underlying the dam. Visual mapping should be supplemented by a field subsurface investigation which would include but not be limited to: location of and determination of the extent of weathered rock, determination of the weathering rate and its effect on the stability of the dam, and determination of any hydrostatic uplift pressures on the dam. In addition, the investigation should provide recommendations for remedial action to correct the problems of seepage through the cracks and the holes in the dam, as well as the seepage through the dam foundation.

*Information provided by Law Engineering Associates of Virginia.

APPENDIX I
MAPS AND DRAWINGS



REGIONAL MAP
LAKE VIEW DAM



CHESTER, VA.

N3715 — W7722.5/7.5

1969
PHOTOREVISED 1974
AMS 5558 IV SW—SERIES V834



DEM GRID AND 1974 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SCALE: 1" = 2000'
10' Contours

VICINITY MAP
LAKE VIEW DAM

APPENDIX II

PHOTOGRAPHS

LAKE VIEW DAM



PHOTOGRAPH NO. 1
Right Abutment
and
Part of Concrete Structure

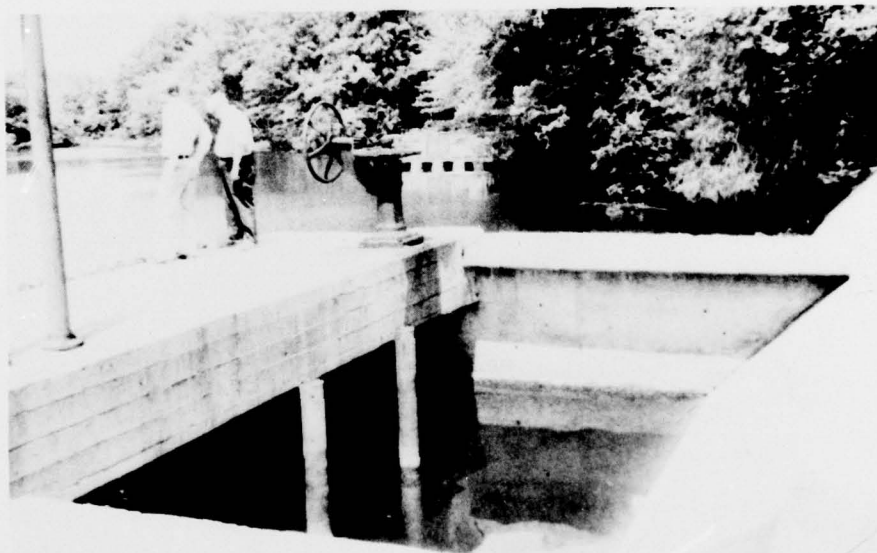


PHOTOGRAPH NO. 2
Left Abutment
and
Part of Concrete Structure

LAKE VIEW DAM



PHOTOGRAPH NO. 3
Catwalk



PHOTOGRAPH NO. 4
Slide Gate

LAKE VIEW DAM



PHOTOGRAPH NO. 5
Discharge from Slide Gate



PHOTOGRAPH NO. 6
Downstream

APPENDIX III
VISUAL OBSERVATIONS

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE	Two white stains above construction joints. Wet area on South Corner.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	No obvious cracks between existing ground and abutments.	
DRAINS	No drains observed during the inspections.	
WATER PASSAGES	None.	
FOUNDATION	Unknown condition. Rock outcrop at downstream bed.	

CONCRETE/MASONRY DAYS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	See diagram, Appendix I.	
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT	No obvious misalignments	
MONOLITH JOINTS	Cracks observed.	Do not indicate major structural problems.
CONSTRUCTION JOINTS	Cracks observed. Approximately 1 gpm.	Do not indicate major structural problems.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	N/A	
INTAKE STRUCTURE	Concrete structure near left abutment with a slide gate.	See photograph No. 4, Appendix II.
OUTLET STRUCTURE		
OUTLET CHANNEL	The natural stream.	
EMERGENCY GATE	Slide gate.	Not completely closed at time of inspection - flow estimated at over 5 gpm/

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Spillway crest, water falls about 1 inch in some places unevenly.	See photo page iii.
APPROACH CHANNEL	Natural stream.	
DISCHARGE CHANNEL	Natural stream.	
BRIDGE AND PIERS	In good condition.	

RESERVOIR

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES		Flat, forrested.	
SEDIMENTATION		Unknown.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)		Bedrock streambed, loose rocks, trees.	
SLOPES		Left bank - 1:1 slope 35 feet high. Right bank - about 20 feet high.	
APPROXIMATE NO. OF HOMES AND POPULATION		Colonial Heights in downstream area. Low lying areas could be flooded during 1/2 PMF with the possibility of extensive property damage.	

GRAVITY DAM DESIGN STABILITY ANALYSIS

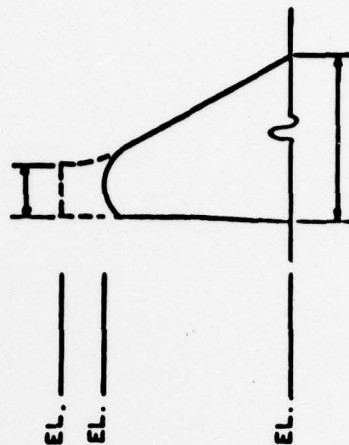
LAKE VIEW DAM

ANALYSIS DONE ON XX FULL SECTION — PARTIAL SECTION
LOCATION OF SECTION

ANALYSIS PREPARED BY CENTER OF SPILLWAY

LOADING CASE	ELEV. HEAD WATER	ELEV. TAIL WATER	ΣV	ΣH	$\frac{\Sigma H}{\Sigma V}$	LOCATION RESULTANT FROM TOE	% BASE IN COMPRESSION	FACTOR SAFETY SLIDING	FOUNDATION PRESSURE	
									TOE	HEEL
NORMAL POOL	55.6	24.0*	36.5 ^k	35.3 ^k	0.97	16.8'			1.1 ksf	1.1 ksf
1/2 PMF	70.5	45.0	28.0 ^k	57.0 ^k	2.04	18.5'			0.6 ksf	1.1 ksf

*NEGLECTED



PARTIAL SECTION

▽ TAILWATER
EL. 24.0

EL. 22.0

STREAMBED EL. 22.0



FULL SECTION

THIS ANALYSIS IS BASED ON THE ASSUMED GEOMETRIC CONFIGURATION SINCE NO DRAWINGS WERE AVAILABLE TO VERIFY THE DIMENSIONS OF THE DAM.

APPENDIX IV

REFERENCES

LIST OF REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Department of the Army, Office of the Chief of Engineers, Washington, D.C. 20314
2. HEC-1 Flood Hydrograph Package, Hydrologic Engineering Center, U S Army Corps of Engineers, Davis, California, 1973
3. U S Weather Bureau and U S Army Corps of Engineers, Seasonal Variations of Probable Maximum Precipitation East of the 105th Median for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24 and 48 Hours, Hydrometeorological Report No. 33, Washington, D.C., April 1956.